

**CLAIMS**

1. Method of tuning an arc welding system comprising an electric circuit (2) including a power source (3), and a control system (20) including computer means (33) and memory means (34), the method comprising; determining values of system input parameters of the electric circuit (2), calculating tuning parameter values from these system input parameters by using a simulation model (21) of the arc welding system, and tuning the arc welding system by implementing the tuning parameter values into the control system (20), **characterized in** that the simulation model (21) is calibrated to represent the actual welding situation by measurement of model parameter values on the welding station on site.
2. Method according to claim 1, wherein the calibration comprises a first calibration mode including;  
short-circuiting (14) the electric circuit over the arc,  
sending a controllable current and voltage through the system, and  
measuring the resistances (10, 12) and the inductances (9, 11) of the electric circuit.
3. Method according to claim 1 or 2, wherein the calibration comprises a second calibration mode including;  
empowering the welding station with full power to produce an arc (13),  
measuring the current (42) and the voltage (45) of the electric circuit, and  
adjusting the model so that predicted values (43, 44) matches the measured values (42, 45).
4. Method according to any of the preceding claims, wherein the calibration comprises a third calibration mode including;  
empowering the welding station with full power to produce an arc (13),  
performing a plurality of process modes by the control unit (20), and  
extracting the characteristic fingerprint pattern of the power source from measurement of current and voltage under each of the performed process modes.
5. Method according to any of the preceding claims, wherein the simulation model is brought to comprise a model component of the metal transport between the electrode

and the workpiece, the metal transport model is brought to comprise a first model part of a region close to the wire, a second model part of the arc column, and a third model part of the metal condensing in the region close to the workpiece.

6. Arc welding system comprising an electric circuit (2) including a power source (3), a welding torch (4) with a consumable welding wire (35), a workpiece (6) and a control system (20) comprising computer means (34) and memory means (35) and including means for tuning the arc welding system, **characterized in** that the control system comprises a simulation model of the arc welding system, means for calibrating the simulation model, input means (46) for receiving measured model parameter values, means for calculating tuning parameter values, and means for implementing these parameter values into the control system.
7. Arc welding system according to claim 6, wherein the arc welding system comprises an industrial robot (1) for operating the torch (4).
8. Arc welding system according to claim 6 or 7, wherein the model parameters of the electric circuit (2) comprises inductance (9) and resistance (10) of a first electric path (7), inductance (11) and resistance (12) of a second electric path, current and voltage of a process mode, and a correspondent behavior of the power source.
9. Arc welding system according to any of claims 6 - 8, wherein the control system (20) comprises computer means for controlling the welding process, and memory means for storing a plurality of synergic lines (15).
10. Computer program product comprising instructions to influence a processor to perform a method according to claim 1 to 5.
11. computer program product according to claim 10 provided at least in part over a network such as the Internet.
12. Computer readable medium containing a computer program according to claim 10.